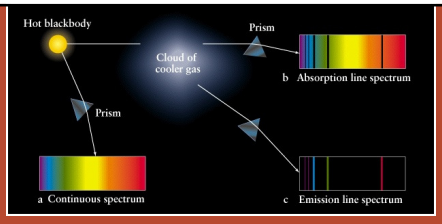
Spectroscopy

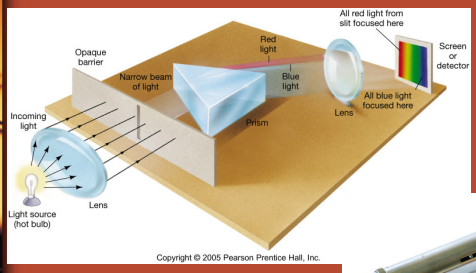


Spectroscopy is the examination of the interaction of matter and energy.

There are 3 types of spectra

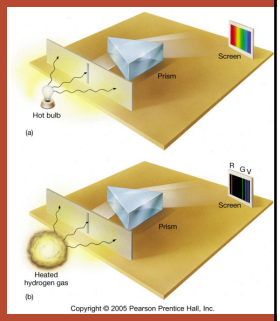
1. Continuous
2. Absorption
3. Emission

A spectroscope splits light into its component colors



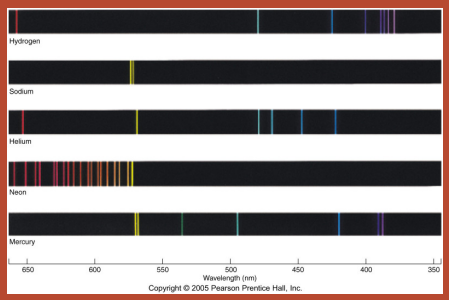
Emission Lines

- Emission lines: single frequencies emitted by particular atoms.
- Emission spectra examine the result of heated (energized) atoms.



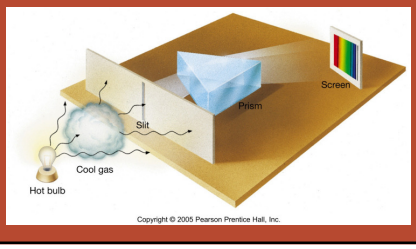
Spectral lines

These emission lines can be used to identify an element.



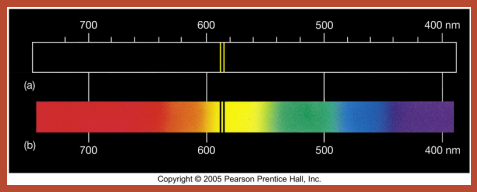
Spectral lines

Absorption spectrum: if a continuous spectrum passes through a cool gas, atoms of the gas will absorb the same frequencies they emit.



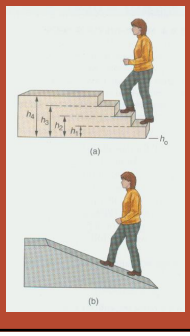
Spectral lines

An absorption spectrum can also be used to identify elements. These are the emission and absorption spectra of sodium:



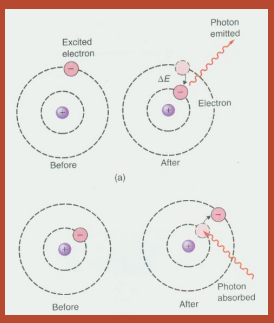
Quantized Energy

Continuous energy is like a ramp.
Quantized energy is like a stair case.
Each stair increases the energy by the value of Planck's constant
$h = 6.63 \times 10^{-34}$ J-s
$E = hf$



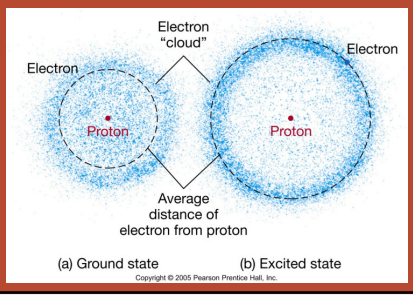
Absorption and Emission Spectra

Emission spectra produced when electron releases energy and drops to a lower orbit.
Absorption spectra produced when electron absorbed energy needed to go to a higher orbit.



Emission energies correspond to energy differences between allowed levels.

Modern model has electron "cloud" rather than orbit:



Dual Nature of light

Light is a wave
- Reflection
- Refraction
- Interference
- Polarization

Light is a particle
- Photoelectric effect
- reflection

E = hf